THE ENDANGERED HAWAIIAN HAWK: STATUS, BIOLOGY, AND PROPOSED RESEARCH

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SPECIES DESCRIPTION

The Hawaiian Hawk or 'Io (Buteo solitarius) is a medium-sized, broad-winged hawk endemic to the Hawaiian Islands. The 'Io occurs mainly on the island of Hawai'i; however, there are nine observations since 1778 of 'Io on the islands of Kaua'i, O'ahu, and Maui (Banko 1980; J. M. Scott, pers. comm.). The 'Io is known to breed only on Hawai'i. Light and dark color phases have been described (Munro 1944), and there are many intermediate plumages. Colors do not differ according to sex but females are substantially larger than males.

The 'Io is widely distributed on the island of Hawai'i, being locally common on the slopes of Mauna Loa, on both the windward and Kona coasts, and to a lesser extent on Mauna Kea (Berger 1972). It occurs at both low and high elevations. The 'Io is now listed as an endangered species by the U. S. Department of the Interior (USDI 1974).

FORMER STATUS

No information concerning the relative abundance and range of the 'Io was recorded during the first century of Hawaiian history. Observations and collection of specimens by five naturalists from 1887 to 1902 characterize the 'Io population of that period as ranging from low to high elevations and as resident in all major districts, varying from rare to common. In the 1890's sightings and collection records suggest that 'Io were more numerous in windward than leeward forests (Banko 1980).

CURRENT STATUS

As in former times, the 'Io is found at both low and high elevations, ranging from sea level to approximately 2600 m (8500 ft). During the 1960's and 1970's, 'Io have been recorded in all major districts of Hawai'i. They are still relatively more abundant in windward than leeward forests, but gaps in their range

appear in leeward Kohala, intermountain saddles and plains, and along the western flank of Mauna Kea (Banko 1980). 'Io densities are low also in subalpine zones and māmanenaio (Sophora-Myoporum) forests (J. M. Scott, pers. comm.). 'Io are observed in both open or parkland forests and dense rain forests. They are also frequently seen in the areas of cane fields and macadamia nut orchards (L. F. Pank, pers. comm.). The 'Io appears to adapt to disturbed forests and to agricultural areas. A recent estimate of the total 'Io population is in the low hundreds (Orenstein 1968).

The 'Io has been recorded within Hawaii Volcanoes National Park (HAVO) for 40 years. Banko (1980) has compiled 212 observations of 'Io in the Park, providing a long-term record. Morrison (1969) reported 64 sightings of 'Io in the Park from January 1967 through December 1968. Baldwin (1969), comparing his data on 'Io observations from 1938 through 1949 with those of Morrison, concluded that 'Io numbers had probably increased within the Park during the 30-year interval. Nevertheless, 62 sightings of 'Io over a two-year period do not suggest a large population.

Munro (1944) stated nearly 40 years ago that the distribution of the 'Io had probably not changed since the 1890's, but that populations had declined since earlier times. Recently, in comparing the historical record with contemporary sightings, Banko (1980) concluded that the 'Io was still present in all the districts that it had been 80 or more years before. He also believed that the 'Io has probably experienced a long-term population decline. However, Banko (1980) stated that conclusions concerning 'Io population size and trend must be considered as tentative due to the lack of more detailed historical information and the scarcity of current knowledge.

Specific reasons for the suspected decline of the 'Io are not known. However, Berger (1972) considered habitat destruction, illegal shooting, and the alteration of the environment by man and introduced domestic animals as the primary causes. The incidence of diseases and parasites in the 'Io population is unknown. The possible occurrence of predation by introduced rats, the mongoose, and feral cats and dogs on 'Io eggs or young is also undocumented. The possible effects of environmental pollutants (pesticides, heavy metals, and rodenticides) as factors affecting the population are also unknown.

BIOLOGY OF THE 'IO

Knowledge of the biology of the 'Io is fragmentary. Records of young produced or fledged are scarce. Bryan (1906) first described a nest of the Hawaiian Hawk, from which two young were collected in early October 1902. Since this time, there have been 10 additional observations in which a number of young produced was known. In five cases, two young were produced and in the other five instances, a single nestling or fledgling was seen (Shallenberger 1977; Banko 1980). These records, combined with a

recent observation by the author of a young fledged in late March or early April 1980, indicate a breeding season extending from January through October.

The eggs of the Hawaiian Hawk have never been described, although clutch size is given in the literature as two to three eggs (Berger 1972). Walker (1969) noted a nest with a "single light blue egg" found by Fergerstrom during May 1961. Banko and Schattauer collected a single deserted egg in June 1969. Chemical analysis at Patuxent Wildlife Research Center, Laurel, MD., yielded traces of DDT and polychlorinated biphenyls (Berger 1972).

The newly hatched young have not been described, nor is information available about the nestling period or the length of juvenile dependency.

Although no detailed study of the food habits has been conducted, available data indicate that the 'Io utilizes a wide variety of prey items. Munro (1944) recorded the remains of mice, rats, spiders, hawkmoths, caterpillars, and rice birds in 'Io stomachs. Baldwin (1969) reported that 'Io prey on common mynas and dragonflies. Preying mantis, barred dove, and crayfish have also been found in 'Io stomachs (Tomich 1971). Other species taken as prey by 'Io include domestic chickens (Banko 1980), wild turkey poults, house finches, and mongooses (Shallenberger 1977 & pers. comm.).

PROPOSED RESEARCH

The Missouri Cooperative Wildlife Research Unit, in cooperation with the U. S. Fish and Wildlife Service, Office of Endangered Species, has initiated a 17-month research program to provide basic life history and ecological information on the Hawaiian Hawk. Our study program includes investigating (1) breeding biology and behavior, (2) home range and habitat utilization, (3) food habits and foraging area, and (4) surveillance for evidence of environmental pollution problems affecting the 'Io. The study began in April 1980 and will continue through August 1981. Main study periods will be during the two breeding seasons of 1980 and 1981 with field observations continuing through the fall and winter of one field season. Study procedures will be as follows:

1. Breeding Biology and Behavior.

A. Nest Observations.--Intensive blind observations at three nest sites during the breeding season will provide data on time of breeding; length of courtship; nest building, incubation, and nestling periods; clutch size; hatching and fledging success; territorial and predator defense; frequency with which prey is brought to the nest; and weight and type of prey utilized. Additionally, how each of these

factors interacts with habitat variables will be examined. Data are needed to identify factors which affect clutch size and hatching success (e.g., predation by mongoose, feral cats, rats, man, environmental pollutants, human disturbance, or other factors).

B. Time-lapse Photography.--During each breeding season, automatic time-lapse movie cameras will be placed at four active 'Io nests that are not under intensive blind observation. Cameras will be used throughout the entire nesting cycle, including incubation, brooding, and fledging periods. This will provide a larger data base from which 'Io behavior at the nest and food habits can be determined.

2. Radio Telemetry.

Twelve 'Io will be radio-tagged with miniature tail-mounted transmitters during the study, if possible. Movements will be monitored in both the breeding and non-breeding periods. This will provide important information on home range size which will assist in determining foraging behavior, habitat use, and population densities. All young 'Io encountered in nests will be banded. Three young will also be radio-tagged so that post-fledging movements can be monitored. The movements of radio-tagged 'Io will be followed by ground triangulation using a null-peak antenna system mounted on a vehicle.

3. Food Habits.

Blind observations, radio telemetry, collection of prey items at nests, time-lapse cameras, and cast pellet collection and analysis will provide information on food habits and foraging behavior of the 'Io.

4. Environmental Pollutants.

The U. S. Fish and Wildlife Service Wildlife Damage Research Station at Hilo will cooperate with the surveillance for evidence of environmental pollutants affecting the 'Io population. This work will center around the nests of 'Io that are utilizing agricultural areas. We hope to label rat populations that are being preyed upon by the 'Io in these areas. This will provide data on whether substantial numbers of rats are taken by the 'Io, indicating the potential for secondary poisoning of 'Io due to the use of rodenticides in agricultural areas. 'Io eggs which fail to hatch will be collected and analyzed for pollutants, and any 'Io found dead will be autopsied.

We hope that data of the types described above will provide a basis for consideration of the needs of the 'Io in all land management decisions.

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